

Novel Silicon Carbide Deep Ultraviolet Detectors: Device Modeling, Characterization, Design and Prototyping, Phase I

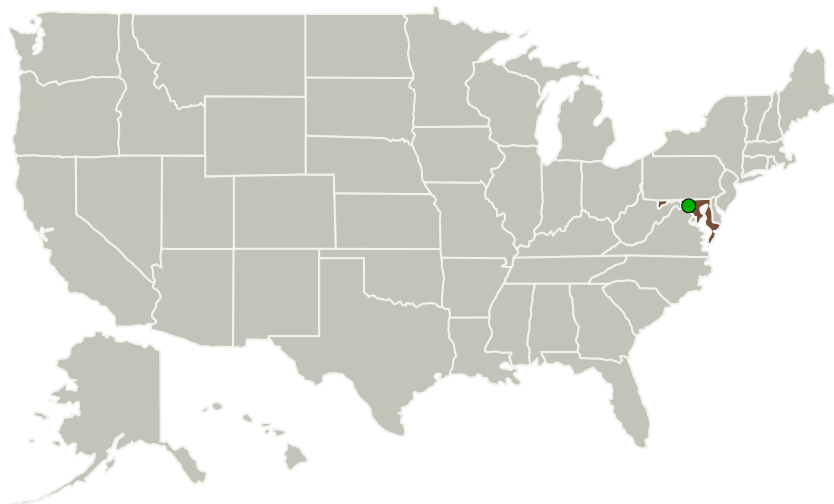
Completed Technology Project (2011 - 2011)



Project Introduction

Silicon Carbide deep UV detectors can achieve large gains, high signal-to-noise ratios and solar-blind operation, with added benefits of smaller sizes, lower operating voltages, radiation hardness, ruggedness and scalability. The design, fabrication and optimization of SiC UV APDs is challenging due to some material defects, relatively not-well modeled device operation, and very high absorption coefficients near 100nm wavelengths. These challenges can be overcome with detailed co-modeling, characterization, design and fabrication. Successfully operating SiC UV detectors are of utmost importance for astronomy, space exploration, upper atmosphere monitoring, and systems such as Non-Line-of-Sight (NLoS) communication. Through Phase I and Phase II, we propose to develop Silicon Carbide (SiC) based UV detectors for space applications. The initial target is the 100nm to 300nm wavelength range, with the peak responsivity expected to be within the 200nm-300nm interval. For the 100nm-200nm wavelength range, we will experiment with the use of an AlGaN cap-layer as the absorber and SiC as the multiplier. Phase I effort will focus on the design and detailed physics based simulation of these SiC APD structures. We will use SiC UV detectors fabricated by the GE Global Research Center and AlGaN APDs from University of Maryland for measurements and calibration.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
CoolCAD Electronics, LLC	Lead Organization	Industry	Takoma Park, Maryland
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140195>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CoolCAD Electronics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

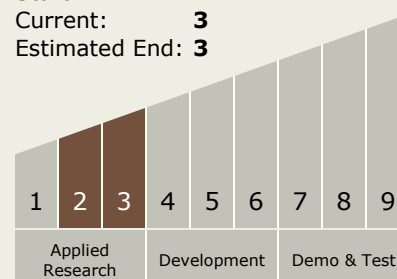
Carlos Torrez

Principal Investigator:

Akin Akturk

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System